Sola 2000 Off-Line Uninterruptible Power Systems (UPS)

The most complete off-line UPS on the market, Sola 2000 UPS's protect against most adverse power conditions. This UPS protects against over and under voltages by raising and lowering utility power to the right level for sensitive equipment – ***all without transfer to battery***. Overload protection continually monitors the UPS load preventing inadvertent shutdown during emergency situations and optimizing battery life.

Full-sequence battery testing delivers comprehensive testing of your battery and system, through both a 14-day automatic test and a single-push manual test, ensuring the battery is emergency ready. With its comprehensive power protection, the Sola 2000 is perfect for PC, Point-of-Sale, Network or Industrial applications. UL and cUL: 115 VAC models. TÜV/GS and CE: 230 VAC models.

Features

- Off-line with Automatic Voltage Regulation (AVR) topology.
- Protects against most adverse power conditions including:
  - Frequency variations
  - Surge
  - Noise
  - Blackouts
  - Lightning
  - Spike
  - Brownouts
  - Over and under voltages
- Data-line surge protection for phone or network included on every unit.
- DB9 Communications Interface.
- Greater uptime with intelligent power management, full-sequence battery testing and two-level overload protection.
- Two-year warranty with optional extensions to five years.
- $25,000 UPS Power Protection Promise.

Applications

- PCs
- Workstations
- PLCs
- Computer peripherals

Selection Table

Capacity (VA/W)	Catalog Number	Volts, Frequency In/Out	Typical Runtime (minutes)*	Input Plug/ Output Receptacle	Approx. Ship Weight lbs (kg)
350/210	S2350	115/115, 50/60 Hz	5/15	5-15P /(4) 5-15R	13.2 (6.0)
470/282	S2470	115/115, 50/60 Hz	5/12	5-15P / (4) 5-15R	15.4 (7.0)
700/420	S2700	115/115, 50/60 Hz	5/13	5-15P / (4) 5-15R	22 (10.0)
350/210	S2350-5	230/230, 50/60 Hz	5/15	EN60320/C14/ (4) EN60320/C13	13.2 (6.0)
470/282	S2470-5	230/230, 50/60 Hz	5/12	EN60320/C14/ (4) EN60320/C13	15.4 (7.0)
700/420	S2700-5	230/230, 50/60 Hz	5/13	EN60320/C14/ (4) EN60320/C13	22 (10.0)

*Full/Half load (in minutes).

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Power A/C Distribution (PAD) and Associate Receptacles/ Line Cord Options for the Series 2000

PADs provide output distribution receptacle, input connection and a rotary maintenance bypass switch. The PAD is field installable by the customer. Use of the PAD allows the UPS to be removed without interrupting power to the load.

Note: PADs can only be used with units having matching receptacles for the line cords provided.

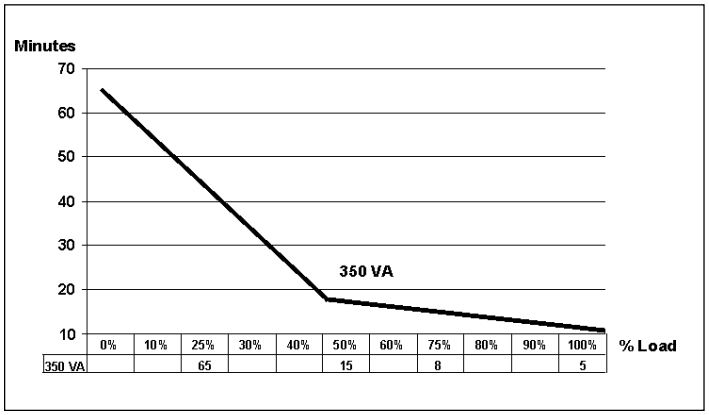
Description	Catalog Number
120 Volt, 5-15P Line Cord/ (8) 5-15R	AD115A
120 Volt, 5-15P Line Cord/ (6) 5-15R, (2) L5-15R	AD115B
230 Volt 50 Hz, IEC 320-10A Line Cord, (4) IEC 320-10 Receptacles	AD220K

Plug & Receptacle Reference Chart

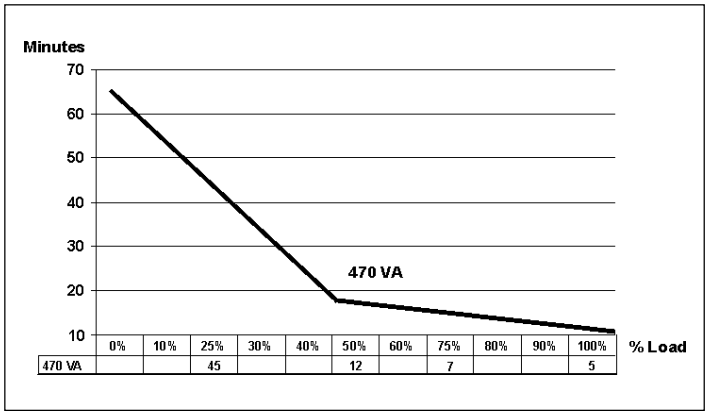
5-15P 5-15R IEC 320-10

Sola 2000 Battery Run Time Charts

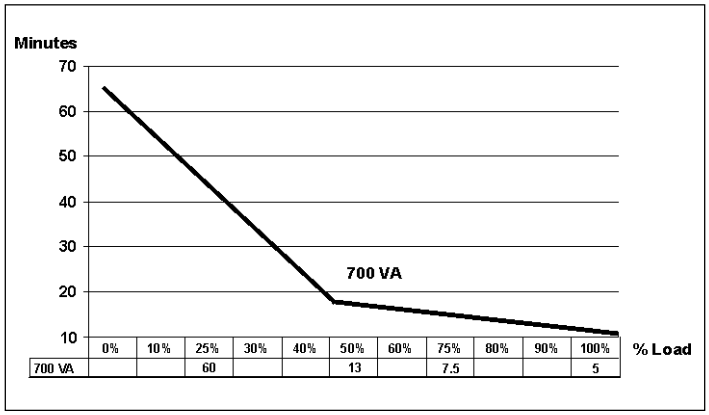
S2350 and S2350-5 Models



S2470 and S2470-5 Models



S2700 and S2700-5 Models



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Sola 2000, 115 VAC Specifications

Catalog Number	S2350	S2470	S2700
Capacity (VA/Watts)	350/210	470/282	700/420
Dimensions - inches (mm)			
Unit (H x W x D)	6.5 x 4.5 x 13.9 (166 x 115.5 x 352.5)	6.5 x 4.5 x 13.9 (166 x 115.5 x 352.5)	6.5 x 4.5 x 13.9 (166 x 115.5 x 352.5)
Shipping (H x W x D)	8.8 x 6.2 x 15.8 (226 x 156 x 404)	8.8 x 6.2 x 15.8 (226 x 156 x 404)	8.8 x 6.2 x 15.8 (226 x 156 x 404)
Approx. Shipping Weight - lbs(kg)	13.2 (6.0)	15.4 (7.0)	22.0 (10.0)
Input AC Parameters			
Voltage Range without Battery Operation	87 to 144 VAC		
Line to Boost Transfer	104 VAC		
Line to Buck Transfer	124 VAC		
Frequency	50/60 Hz		
Input Power Cord	6 ft. detachable, with NEMA 5-15P		
Output AC Parameters			
Voltage (Battery Mode)	115 VAC, ± 5%		
Receptacles	5-15P / (4) 5-15R	5-15P / (4) 5-15R	5-15P / (4) 5-15R
Waveform (Battery Mode)	Stepped Sinewave		
Voltage (Normal)	V_{in} x 1.0		
Voltage (Boost Mode)	V_{in} x 1.16		
Voltage (Buck Mode)	V_{in} x 0.84		
Frequency	50 Hz or 60 Hz; auto sensing		
Overload Warning (Utility and Battery Modes)	101-120%		
Overload Shutdown (Utility and Battery Modes)	Overload + (15-30 W)	Overload + (20-40 W)	Overload + (30-60 W)
Battery Parameters			
Battery Type	Sealed, Valve-Regulated Lead Acid, 3-5 years typical		
Battery Qty x Voltage x Rating	(1) x 12 V x 7.0 AH	(1) x 12 V x 7 AH	(1) x 12 V x 10 AH
Transfer Time	4-6 ms typical		
Back-up Time:	See Battery Run Time Charts		
Full Load	> 5 minutes typical		
Half Load	> 15 minutes typical	> 12 minutes typical	> 13 minutes typical
Recharge Time	7-10 hours to 90% capacity, after full discharge into 100% resistive load		
Environmental			
Operating Temperature	+32 °F to +104 °F (0 °C to +40 °C)		
Storage Temperature	+5 °F to +122 °F (-15 °C to +50 °C)		
Relative Humidity	0% to 90%, non-condensing		
Operating Elevation	Up to 10,000 ft. (3000 m) at 95 °F (35 °C) without derating		
Audible Noise	Less than 40 dB @ 1 meter		
Agency			
Safety	UL 1778, C-UL Listed		
ESD	IEC 801-2, Level 3, Criterion less than or equal to 2		
Surge Protection	Meets IEEE C62.41, Category A		
Susceptibility	IEC 801-3, Level 3, Criterion less than or equal to 2		
Electrical Fast Transient/Burst	IEC 801-4, Level 4, Criterion less than or equal to 2		
Emissions	FCC Part 15, Subpart B, Class B		

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Sola 2000, 230 VAC Specifications

Catalog Number	S2350-5	S2470-5	S2700-5
Capacity (VA/Watts)	350/210	470/282	700/420
Dimensions - inches (mm)			
Unit (H x W x D)	6.5 x 4.5 x 13.9 (166 x 115.5 x 352.5)	6.5 x 4.5 x 13.9 (166 x 115.5 x 352.5)	6.5 x 4.5 x 13.9 (166 x 115.5 x 352.5)
Shipping (H x W x D)	8.8 x 6.2 x 15.8 (226 x 156 x 404)	8.8 x 6.2 x 15.8 (226 x 156 x 404)	8.8 x 6.2 x 15.8 (226 x 156 x 404)
Approx. Shipping Weight - lbs (kg)	13.2 (6.0)	15.4 (7.0)	22.0 (10.0)
Input AC Parameters			
Voltage Range without Battery Operation	166 to 275 VAC		
Line to Boost Transfer	198 VAC		
Line to Buck Transfer	250 VAC		
Frequency	50/60 Hz		
Input Power Cord	EN60320/C14 recessed plug		
Output AC Parameters			
Voltage (Battery Mode)	230 VAC, ± 5%		
Receptacles	(4) EN60320/C13 sockets, (2) detachable EN60320-2-2 1.8m (6") power cords		
Waveform (Battery Mode)	Stepped Sinewave		
Voltage (Normal)	V_{in} x 1.0		
Voltage (Boost Mode)	V_{in} x 1.13		
Voltage (Buck Mode)	V_{in} x 0.85		
Frequency	50 Hz or 60 Hz; auto sensing		
Overload Warning (Utility and Battery Modes)	101-120%		
Overload Shutdown (Utility and Battery Modes)	Overload + (15-30 W)	Overload + (20-40 W)	Overload + (30-60 W)
Battery Parameters			
Battery Type	Sealed, Valve-Regulated Lead Acid, 3-5 years typical		
Battery Qty x Voltage x Rating	(1) x 12 V x 7.0 AH	(1) x 12 V x 7 AH	(1) x 12 V x 10 AH
Transfer Time	4-6 ms typical		
Back-up Time:	See Battery Run Time Charts		
Full Load	> 5 minutes typical		
Half Load	> 15 minutes typical	> 12 minutes typical	> 13 minutes typical
Recharge Time	7-10 hours to 90% capacity, after full discharge into 100% resistive load		
Environmental			
Operating Temperature	+32 °F to +104 °F (0 °C to +40 °C)		
Storage Temperature	+5 °F to +122 °F (-15 °C to +50 °C)		
Relative Humidity	0% to 90%, non-condensing		
Operating Elevation	Up to 10,000 ft. (3000 m) at 95 °F (35 °C) without derating		
Audible Noise	Less than 40 dB @ 1 meter		
Agency			
Safety	EN50091-1, TUV/GS listed, CE Compliance Mark		
ESD	IEC 801-2, Level 3, Criterion less than or equal to 2		
Surge Protection	IEC 801-5, Level 3,		
Susceptibility	IEC 801-3, Level 3, Criterion less than or equal to 2		
Electrical Fast Transient/Burst	IEC 801-4, Level 4, Criterion less than or equal to 2		
Emissions	EN50091-2, EN55011 Class B		

Uninterruptible Power Supply Systems - Sola 2000

Guide Specifications for a Sola2000 250 to 600 VA
Single - Phase Uninterruptible Power Supply System

1.0 GENERAL

1.1 SUMMARY

This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty single-phase, solid state, uninterruptible power supply system. The uninterruptible power supply system, hereafter referred to as the UPS, shall provide continuous AC power for sensitive electronic equipment loads.

1.2 STANDARDS

The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

115V Units

- UL Standard 1778
- UL Standard 1449
- FCC Part 15, Subpart B, Class B
- IEEE 587, Category A and B
- C-UL (CAN\CSA 22.2 No. 107.1)

230V Units

- EN 50091-1
- EN 55022, Class B
- IEC 801-2
- IEC 801-3
- IEC 801-4
- IEC 801-5
- EN60950
- EN50091-1
- CE compliance mark
- EMC Directive 89/336/EEC

1.3 SYSTEM DESCRIPTION

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1.3.1 Modes of Operation

The UPS shall be designed to operate as an off-line system in the following modes:

A. Normal - The critical AC load is continuously supplied with filtered power. The battery charger shall maintain a float-charge on the battery.

B. Emergency - Upon failure of utility AC power, the critical AC load is supplied by the inverter which obtains power from the battery.

C. Recharge - Upon restoration of utility AC power, after a utility AC power outage, the critical AC load shall be supplied with filtered power and the battery charger shall simultaneously recharge the battery automatically. The unit shall recharge whether the switch is in the on or off position (off state charging).

E. Dark Start - (400/600 VA only) The UPS shall have the ability to startup in the back-up mode without the presence of utility power.

1.3.2 Design Requirements

A. Voltage: Input/Output voltage specifications of the UPS shall be:

Input:

115V units: 0 to 135 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground.

230V units: 0 to 270 VAC, 50/60 Hz, single phase, 2-wire-plus-ground

Output:

115V units: 115 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground.

230V units: 230 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground

B. Output Load Capacity: Specified output load capacity of the UPS shall be:

- 250VA/150W
- 400VA/240W
- 600VA/360W

C. Internal Battery: The battery shall consist of sealed, valve regulated, reduced maintenance, lead acid cells. The batteries shall be user-replaceable.

D. Reserve Time: Minimum 5 minutes at full load with ambient temperature between 20^{o} and 30^{o} C.

E. Battery Recharge: The recharge time shall be the following, to 90% capacity after discharge into a full load.

- 250VA 12-14hrs maximum
- 400/600VA 6-8hrs maximu

1.3.3 Performance Requirements

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1.3.3.1. AC Input to UPS

A. Voltage Configuration:

115VAC; +10%, -25% (90 to 135 VAC), single phase, 2-wire-plus-ground

230VAC; +15%, -22% (180 to 270 VAC), single phase, 2-wire-plus-ground

B. Frequency: 50 Hz or 60 Hz. UPS frequency is set via a DIP switch

C. Surge Protection: Sustains input surges without damage per criteria listed below:

115VAC - IEEE587, Category A & B; 240 Joules

230VAC - IEC 801-5 (Draft); 80 Joules

D. Input:

115 VAC units
All models shall have a 6 foot input power cord with a NEMA 5-15P plug.

230 VAC units
The input for all models shall be a CEE 22 recessed plug on the UPS. Specific country receptacles shall be accommodated by using the computer's input cord to feed the UPS.

1.3.3.2. AC Output, UPS Inverter (On Backup)

A. Voltage Configuration: 115VAC, single-phase-2-wire-plus-ground.

B. Voltage Regulation: +/- 5% for entire battery voltage range.

C. Frequency Regulation: +/- 2Hz

D. Output Power Rating: .6pf for all models

E. Overload Capability: 115% of power rating

F. Transient Recovery Response Time: 100% step load to within 90% of nominal output voltage within 500 milliseconds.

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient Temperature

Operating: 0^{o} C to $+40^{o}$ C

Storage: -35^{o} C to $+50^{o}$ C w/o battery
-20^{o} C to 40^{o} C for optimum battery performance

B. Relative Humidity

Operating: 0 to 95% non-condensing

Storage: 0 to 95% non-condensing

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C. Altitude

Operating: 3000 m (10,000 ft max.)

D. Audible Noise

Noise generated by the UPS during battery operation shall not exceed 40 dB measured at 1 meter from the surface of the UPS.

1.5 USER DOCUMENTATION

The specified UPS shall be supplied with one (1) user's manual. Manuals shall include installation drawings and instructions, a functional description of the equipment with block diagrams, safety precautions, illustrations, step by step operating procedures, and general maintenance guidelines. User manual for the 230V models shall be multi-lingual.

1.6 WARRANTY

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for two (2) years. The warranty shall cover all parts and labor. An optional one (1) or three (3) year extended warranty shall be available from the manufacturer.

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer Qualifications

A minimum of twenty years experience in the design, manufacture, and testing of solid-state UPS systems is required.

1.7.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

2.0 PRODUCT

2.1 FABRICATION

All materials and components making up the UPS shall be new, of current manufacture, and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All relays shall be provided with dust covers.

2.1.1 Cabinet

The UPS unit shall be comprised of: battery charger, inverter, transfer switches, all associated controls, monitoring, major protection devices and battery consisting of the appropriate number of sealed battery cells. The UPS cabinet shall be cleaned, primed, and painted with the manufacturer's standard color. Dimensions shall be:

250 VA	3.51" (90mm) W x 10.18" (261mm) D x 6.79" (174mm) H
400 VA	4.25" (108mm) W x 10.18" (261mm) D x 7.02" (186mm) H
600 VA	4.85" (124mm) W x 10.18" (261mm) D x 8.15" (215mm) H

2.1.2 Cooling

The UPS shall be convection cooled.

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2.2 COMPONENTS

2.2.1 Power Train

A. Input Protection

The UPS shall employ an input circuit breaker. The UPS shall sustain input surges without damage per criteria listed in:

115VAC - IEEE587, Category A & B; 240 Joules

230VAC - IEC 801-5 (Draft); 80 Joules

B. Battery Recharge

The battery shall use constant voltage charging to recharge and maintain the battery.

C. Unit DC Protection

The unit shall be protected by the following DC shutdown levels:

- DC Undervoltage Shutdown (End of Discharge)
- DC Undervoltage Warning (Low Battery Reserve

D. Overload

The UPS shall be capable of supplying current and voltage for overloads exceeding 115% of full load current for 30 minutes. A visual indicator and audible alarm shall indicate overload operation. The 400/600VA models shall provide a visual indicator and audible alarm.

E. Output Frequency

The output frequency during normal operation shall follow the incoming AC frequency within a +/- 3Hz window.

F. Battery Over Discharge Protection

To prevent battery damage from over discharging, the UPS control logic shall automatically raise the shutdown voltage set point based on lighter loading.

2.2.2 Display and Controls

A. General

The UPS shall provide the operator with both visual and audible status indicators and shall indicate the following conditions:

400 & 600 VA Units

- Fail startup battery test
- Input L-N reversed
- Input frequency mismatch with DIP switch setting
- Input line voltage below threshold
- Output overload - short circuit
- Normal Mode
- Charger fail
- Battery test fail
- Input line overvoltage

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- Output overload - short circuit
- Low battery
- UPS shutdown (end of discharge)
- UPS shutdown via communication port

250 VA Units

- Fail startup battery test
- Input L-N reversed
- Input frequency mismatch with DIP switch setting
- Input line voltage below threshold
- Output overload - short circuit
- Normal Mode
- Battery test fail
- Input line over voltage
- Output Overload - short circuit
- Low Battery
- UPS shutdown (end of discharge)

B. Controls

The UPS shall contain a front panel mounted main On/Off switch. The UPS shall also contain microcontroller-based monitoring and controls for reliable operation.

C. DIP Switch Operation

The UPS shall contain four user-selectable DIP switches that will allow the following:

Switch 1	50/60Hz selection
Switch 2	Enable or Disable High Line Alarm
Switch 3	Transfer to Battery Setpoint
Switch 4	Enable/Disable line to neutral reversal alarm

D. Alarm Silence

On 400 and 600 VA models, the alarm silence switch shall be used to silence the On Battery alarm only, whether utility power is present or not, except when operating in a low battery condition.

2.2.3 Automatic self diagnostic tests

The UPS shall perform three (3) different automatic self-diagnostic tests as described below:

A. Automatic self-diagnostic test: Power ON

The UPS must qualify the utility line voltage before initiating start-up. Qualification of the utility shall consist of verifying utility power is within start-up voltage range.

Once the utility power has been qualified and followed by the UPS being switched ON, the UPS shall perform start-up tests, consisting of an electronics and battery test, prior to enabling output power from the inverter. Should the UPS fail any start-up test, the output power shall not be enabled and fault signals (visual and audible) shall be enunciated.

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B. Automatic self-diagnostic test: Auto-restart

The UPS must qualify the utility line voltage before auto-restarting. Auto-restart shall be defined as the restart of the UPS once utility power has returned (and qualified) after the UPS has shutdown due to battery depletion.

Once the utility power has been qualified, the UPS shall perform auto-restart tests, consisting of an electronics and battery test, prior to enabling output power from the unit. Should the UPS fail any test, the output power shall not be enabled and fault signals (visual, audible, and remote via communications port) shall be enunciated.

C. Automatic self-diagnostic test: Weekly

The UPS contains a counter which will initiate a battery test after seven days (168 hrs) of continuous normal mode operation. The test duration shall be approximately 15 seconds. Should a failure of the battery occur, the UPS will immediately return to normal mode and fault signals (visual, audible, and remote via communications port) shall be enunciated. The seven day timer shall be reset after a manual battery test, back-up mode operation or if the UPS is switched OFF. No audible or remote (via communications port/contact closures) indication of the battery test shall be enunciated during the duration of the automatic battery test.

2.2.4 Manual Battery Test (400 and 600 VA only)

The manual battery test switch on the back of the 400 & 600 VA units shall initiate a manual battery test only when utility power is present and no alarm conditions are present. The test shall operate the same as the automatic weekly test described in section 2.2.3 of this specification. Should the UPS batteries not be capable of supporting the connected load for the test duration, the UPS shall immediately return to normal operation, without loss of connected load and fault signals (visual, audible, and remote via communication port) shall be enunciated. No audible or remote (via communication port/contact closures) indication of the battery test shall be enunciated during the duration of the manual battery test.

2.2.5 Internal Battery

Sealed, valve-regulated, reduced-maintenance, lead acid cells shall be used as a stored-energy source for the specified UPS system. The battery shall be housed internal to the UPS cabinet, and sized to support the inverter at rated load and power factor, with ambient temperature between 20^{o} and 30^{o} C, for a minimum of 5 minutes reserve time. The batteries shall be user-replaceable.

2.2.6 Output Distribution

115 VAC units

Output distribution shall be integral to the UPS and located on the rear of the unit with the following receptacles:

250VA	(2) NEMA 5-15
400VA	(4) NEMA 5-15
600VA	(4) NEMA 5-15

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230 VAC units

Output distribution shall be integral to the UPS and located on the rear of the unit with the following receptacles:

250VA	(2) CEE-22
400VA	(4) CEE-22
600VA	(4) CEE-22

(2) cords shall be provided with each unit to connect the UPS output to the load.

2.2.7 Communications

The 400 and 600 VA models shall contain a DB25 connector on the rear panel to allow UPS status communications to a computer system. The DB25 shall contain contact closures to signal on battery and low battery operational status. The UPS shall also be capable of receiving a signal from the connected host system to initiate a UPS shutdown. This signal shall be a + 5 V to +12 V (RS232 level) that must remain for > 0.1 second duration.

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